DOCUMENT RESUME

ED 183 755 CE 024 150

TITLE Earth and Physical Science. Nevada Competency-Based Adult High School Diploma Project.
INSTITUTION Nevada Univ., Las Vegas. Coll. of Education.
SPONS AGENCY Nevada State Dept. of Education, Carson City. Div. of Adult, Continuing and Community Education.
PUB DATE 79
NOTE 67p.; For related documents see CE 024 140-151.

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS *Adult Education; Adults; Answer Keys; *Competency Based Education; Curriculum Guides; *Evaluation Criteria; *High School Equivalency Programs; Minimum Competencies; *Physical Sciences; Skills; Tests
IDENTIFIERS *Nevada CBAHSD Project

ABSTRACT

This document is one of ten curriculum guides developed by the Nevada Competency-Based Adult High School Diploma (CBAHSD) Project. This curriculum guide on earth and physical science is divided into twelve topics. The topics included are Geology, Meteorology, Astronomy, Natural Disasters, Chemical Reaction, Laboratory, States of Matter, Force and Energy, Electricity, Radioactivity, Metals, and Household Chemicals. Competency statements and performance indicators are provided for each topic area. The performance indicators are designed to be used as pre- and post-tests. Answer keys are also provided. This set of curriculum guides is accompanied by both a teacher's guide and a student handbook. (BM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED183755

EARTH and PHYSICAL SCIENCE

NEVADA COMPETENCY BASED
ADULT HIGH SCHOOL DIPLOMA PROJECT

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

CE 024 150

INTRODUCTION

This section is considered to be equivalent to a one-half credit course, with Life Science making a full credit science course. The emphasis of this package is on Earth and Physical Science.

The pre-test and post-test items are suggested for each competency, but the field test instructor recommends that given enough time, the students should be required to do every item on both the pre-tests and the post-tests. The final decision is left to the individual instructor to determine if a student's performance indicates proficiency. It is recommended that if a multiple-choice type of pre-test item is administered, that it be backed up with an additional item or a student-instructor discussion/questioning regarding the student's answer on the multiple-choice item. This will allow the instructor to effectively determine the student's areas of knowledge.

The individual instructor may elect to present the competencies in a different order than appears here. Reordering of the competencies will not effect the effectiveness of the course.

TOPICS

EARTH SCIENCE

Geology

Meteorology

Astronomy

Natural Disasters

PHYSICAL SCIENCE

Chemical Reaction

Laboratory

States of Matter

Force and Energy

Electricity

Radio Activity

Metals

Household Chemicals

EARTH SCIENCE

Geology

The student will be able to describe two specific types of water erosion, one type of ice erosion, and one type of wind erosion; and will be able to state in writing or orally, how three of those specific types of erosion can be reduced in magnitude.

ES - 1

Pre-test: #1

Post-test: #2 or #4

PERFORMANCE INDICATORS:

1. Write down two specific ways that water can cause erosion of rocks and/or the soil, one way that ice can cause erosion, and one way that wind can cause erosion. Then write how three of those forms or erosion can be made to slow down.

2. Tell your instructor two specific ways that water can cause erosion of rocks or the soil, one way that ice can cause erosion, and one way that wind can cause erosion. Then tell your instructor how three of those forms of erosion can be made to slow down.

3. Draw sketches showing two types of water erosion of rocks and/or of the soil, one type of ice erosion, and one type of wind erosion. Then draw sketches showing how three of these types of erosion can be made to slow down.

4. What are two ways that water causes erosion in rocks and/or the soil? What is one way that ice causes erosion? What is one way that wind causes erosion? How can three of these forms of erosion be made to slow down? (written)

EARTH SCIENCE

Meteorology

ES - 2

Pre-test: #1

Post-test: #4

The student will be able to identify the two most common gases that make up the atmosphere and their approximate percentage of composition.

PERFORMANCE INDICATORS:

1. Fill in the blanks.

   The most common gas found in the atmosphere is _____.

   Its percentage of compositon is about _____.

   The next most common gas in the atmosphere is _____.

   Its percentage of composition is about _____.

2. Circle the numbers of the two most common gases found in the atmosphere. Then match only those two with the letter of the approximate percentage of composition of the atmosphere.

_____ 1. carbon dioxide	A) 78%
	B) .03%
_____ 2. argon	C) 12%
	D) 87%
_____ 3. nitrogen	E) 21%
	F) .07%
_____ 4. oxygen	

3. Circle the correct answers.

   The correct order of the following gases found in the atmosphere, from the most common to least common, is:

A. nitrogen, carbon dioxide, oxygen

B. nitrogen, oxygen, carbon dioxide

C. oxygen, nitrogen, argon

D. oxygen, nitrogen, carbon dioxide

E. oxygen, carbon dioxide, nitrogen

Notice the first two gases of the answer you just circled. The percentage of composition of the atmosphere that each make up is approximately (Circle the two correct answers.)

A. 78%
B. 21%
C. 82%
D. 17%
E. .03%

4. What are the two most common gases found in the atmosphere? What are their percentages of composition respectively? (written or oral)

EARTH SCIENCE

Meteorology

ES - 3

Pre-test: #3

Post-test: #1 and #2

The student will be able to identify the most likely conditions for it to rain or snow, when given the following specific information (humidity, barometric pressure and change in barometric pressure).

PERFORMANCE INDICATORS:

1. Circle the letter of the group of weather statistics that show the most likely conditions for it to start raining or snowing in each question.

   A. 1. humidity - 76%
      barometric pressure - 30.29 inches of mercury, rising

      2. humidity - 76%
      barometric pressure - 29.55 inches of mercury, falling

      3. humidity - 95%
      barometric pressure - 29.55 inches of mercury, falling

      4. humidity - 95%
      barometric pressure - 30.29 inches of mercury, rising

   B. 1. humidity - 89%
      barometric pressure - 29.43 inches of mercury, falling

      2. humidity - 62%
      barometric pressure - 30.83 inches of mercury, falling

      3. humidity - 89%
      barometric pressure - 30.83 inches of mercury, rising

      4. humidity - 62%
      barometric pressure - 29.43 inches of mercury, rising

2. Identify which of the terms below correctly fits each blank and fill it in.

   86%, 57%, 30.42 inches, 29.99 inches, rise, fall

The most likely conditions for it to rain or snow would be _____ for humidity, _____ for barometric pressure, and the pressure will _____.

3. Match the letter of the correct answer with the number of the question.

_____ 1. If it is about to rain or snow, the humidity will most likely be _____.

_____ 2. If it is about to rain or snow, the barometric pressure will probably be _____.

_____ 3. If it is about to rain or snow, the barometric pressure will probably also be _____.

A. 62%
B. 30.43 inches mercury
C. 57%
D. rising
E. falling
F. 29.72 inches mercury
G. 89%
H. 79%

4. Circle the letter of the group of weather statistics that show the most likely conditions for it to start raining or snowing in each question.

A. 1. humidity - 59%
barometric pressure - 30.14 inches of mercury, rising

2. humidity - 59%
barometric pressure - 30.14 inches of mercury, falling

3. humidity - 59%
barometric pressure - 30.54 inches of mercury, rising

humidity - 43%
barometric pressure - 30.54 inches of mercury, falling

B. 1. humidity - 14%
barometric pressure - 30.58 inches of mercury, rising

2. humidity - 78%
barometric pressure - 29.89 inches of mercury, falling

3. humidity - 78%
barometric pressure - 29.89 inches of mercury, rising

4. humidity - 14%
barometric pressure - 30.58 inches of mercury, falling

EARTH SCIENCE

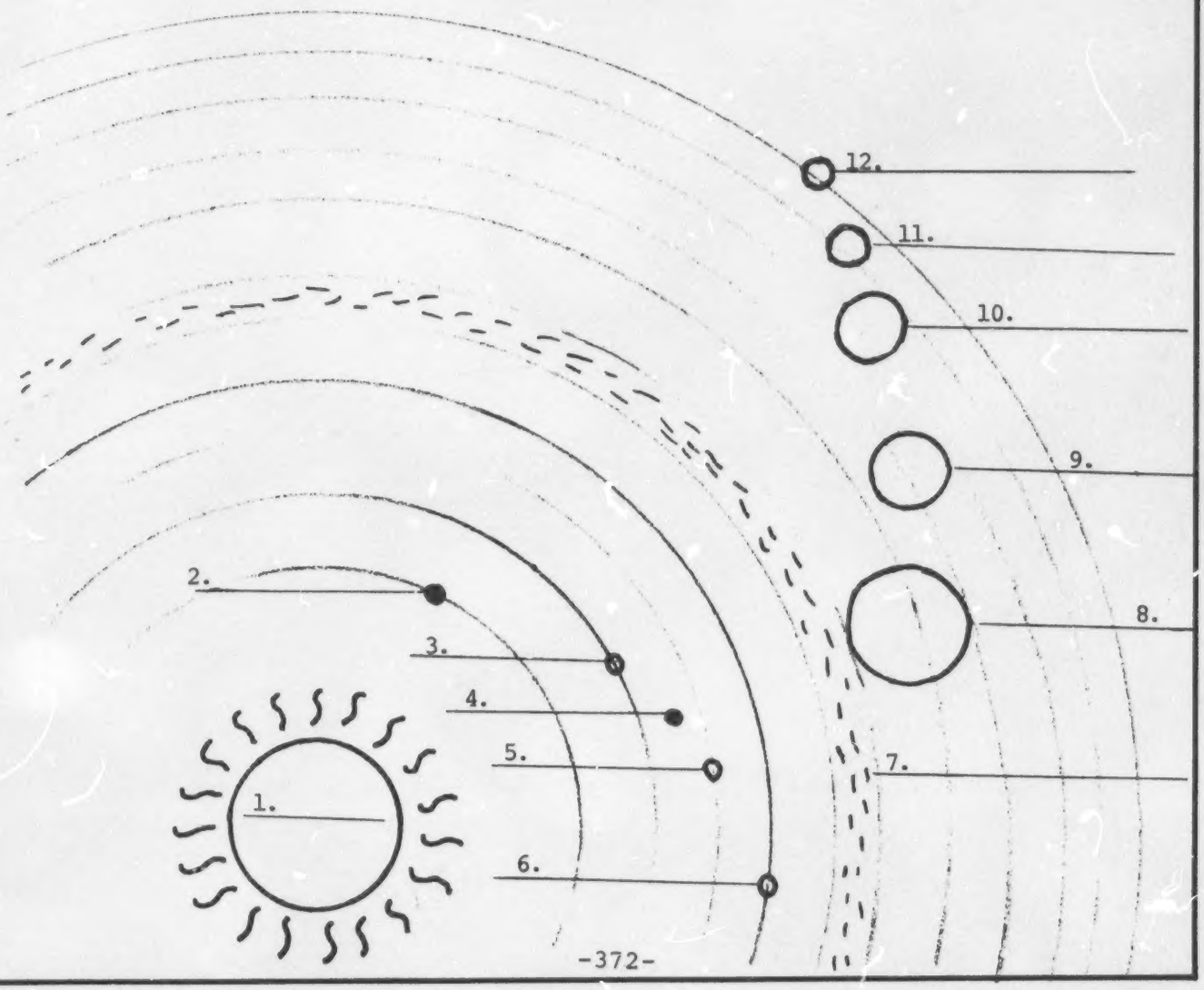
Astronomy

The student will be able to create or correctly label an existing model of the solar system including the Sun, the planets and their orbits in order from the Sun, the asteroid belt, and the Moon and its orbit around the Earth.

ES - 4

Pre-test: #1 or #4
Post-test: #2 or #3

1. Here is a diagram of the solar system. Label all 12 parts correctly.



2. Draw a diagram of our solar system. Include the Sun, Moon, the asteroid belt, Neptune, Earth, Mars, Mercury, Uranus, Jupiter, Pluto, Venus, Saturn. Show the orbital paths of the Moon, the planets, and the asteroid belt.

   (Be sure to draw the Sun largest; the smallest planet must be drawn smaller than any of the other planets. The largest planet must be drawn larger than any ofther planet, but smaller than the sun. Draw the Moon smaller than Earth.)

   Label everyone of the above 12 things.

3. Given an accurate model of our solar system, tell your instructor where each of the following is located on the model: Sun, Moon, asteroid belt, Neptune, Earth, Mars, Mercury, Jupiter, Venus, Pluto, Saturn, Uranus).

4. Make a model of our solar system. Include the Sun, Moon, the asteroid belt, Neptune, Earth, Mars, Mercury, Uranus, Jupiter, Pluto, Venus, Saturn. Show what position the planets orbit around the sun. Show what planetthe Moon orbits around. Make the Sun largest. Make the smallest planetsmaller than all the other planets. Make the largest planet larger than all the other planets, but smaller than the Sun. Make the Moon smaller than Earth. Label every one of the above 12 things.

EARTH SCIENCE

Natural Disasters

The student will identify the best action to be taken during the following crises (flood, volcanic eruption, lightning storm, forest fire, earthquake, tidal wave, tornado, hurricane).

ES - 5

Pre-test: #2

Post-test: #1 and #4

PERFORMANCE INDICATORS:

1. Match each natural disaster with the best action to take to avoid injury during the disaster. Put the correct letter in the space before each number. Answers are only used once.

_____ 1. flood	A. move inland as far as possible
_____ 2. volcanic eruption	B. board up all windows in your house and move all loose things inside
_____ 3. lightning storm	C. head for the high ground away from the rising water
_____ 4. forest fire	D. get behind the path of the moving front of the disaster; if caught in the disaster, stay low and get wet
_____ 5. earthquake	E. stay out of buildings and away from anything that might fall on you
_____ 6. tidal wave	F. it is good to keep a few windows open so that the very low poressure will not cause your house to explode; stay indoors
_____ 7. tornado	G. stay away from trees, flagpoles, etc.; if out in the open, lie down
_____ 8. hurricane	H. get as far away from the area as possible; beware of hot flying objects

2. Here is a list of natural disasters. Following each one are several possible courses of action to take. Circle the answer of the one that would most likely protect you from injury.

1) flood
   A. stay with your house; get on the roof if the water rises into the house
   B. move to higher ground at the first warnings
   C. get out your rowboat and prepare for the worst

2) volcanic eruption
   A. move out of the eruption area as quickly as possible, protecting yourself from falling lava and ash
   B. stay in your house and get the garden hose ready to try to stop the lava with water
   C. board up your windows and doors and stay inside

3) lightning storm
   A. stand under a tree and try to keep dry
   B. get away from all trees; get inside if possible; if you're in a car, stay there
   C. wear rubber boots so you don't get electrocuted if the lightning strikes you

4) forest fire
   A. try to put the fire out with your garden hose; if caught in the fire, stay low and get your clothes wet
   B. stay indoors and wait for the fire to pass by
   C. get out of the path of the fire; if caught in the fire, stay low and get your clothes wet

5) earthquake
   A. stay inside
   B. stay out of and away from buildings
   C. try to get to high ground

6) tidal wave

A. stay inside

B. stay out and away from buildings

C. try to get to high ground

7) tornado

A. open a few windows to the low pressure of the storm does not cause your house to explode

B. board up the windows and stay indoors

C. stay out of and away from buildings

8) hurricane

A. open a few windows so the low pressure of the storm does not cause your house to explode

B. board up the windows and stay indoors

C. stay out and away from buildings.

3. Here is a list of natural disasters. What is the best course of action to take in each case? (written or oral)

1. flood
2. volcanic eruption
3. forest fire
4. lightning storm
5. earthquake
6. tidal wave
7. tornado
8. hurricane

4. Fill in the blanks with the following terms. Each is used only once.

flood
volcanic eruption

lightning storm
forest fire
earthquake
tidal wave
tornado
hurricane

During a(n) _____ it is best to stay out of buildings. If a(n) _____ is about to hit, it is best to get as far inland as possible. During a(n) _____ it is best to head for high ground and wait it out. During a(n) _____ _____ it is best to stay indoors; however, if caught out in the open, it is best to lie down. Just before a(n) _____ it is best to board up all the windows in your house. Just before a(n) _____ it is best to leave a few windows open so your house won't explode. If a(n) _____ occurs nearby, it is best to leave the area and stay away until it is over. If you get caught in a(n) _____ it is best to stay low and get your clothes wet.

PHYSICAL SCIENCE

Chemical Reaction

The student will be able to write balanced equations for at least three chemical reactions, when given the names of one or two ingredient substances and one or two product substances. The student will also be able to identify each reaction as endothermic or exothermic, when given either that heat is needed for the reaction to occur or that heat is produced by the reaction.

PS - 6

Pre-test: #1

Post-test: any

PERFORMANCE INDICATORS:

1. Here are three chemical reactions. Write a balanced chemical equation, using the chemical formulas, for each reaction. Include "heat" on the side of the equation that it should appear. Last of all, tell whether each equation is exothermic or endothermic.

   1) Carbon (C) and oxygen (O_2) combine to produce carbon dioxide (CO_2) and heat.

   2) Hydrogen (H_2) and oxygen (O_2) combine to produce water (H_2O) and heat.

   3) Water (H_2O) and carbon (C) and heat combine to produce carbon monoxide (CO) and hydrogen (H_2).

2. Here are three chemical reactions. Write a balanced chemical equation, using the chemical formulas, for each reaction. Include "heat" on the side of the equation that it should appear. Last of all, tell whether each equation is exothermic or endothermic.

   1) Methane (CH_4) and oxygen (O_2) combine to produce carbon dioxide (CO_2) and water (H_2O) and heat.

   2) Water (H_2O) and carbon (C) and heat combine to produce carbon monoxide (CO) and hydrogen (H_2)

   3) Carbon monoxide (CO) and oxygen (O_2) combine to produce carbon dioxide (CO_2) and heat.

3. Here are three chemical reactions. Write a balanced chemical equation, using the chemical formulas, for each reaction. Include "heat" on the side of the equation that it should appear. Last of all, tell whether each equation is exothermic or endothermic.

   1) Nitrogen (N_2) and oxygen (O_2) and heat combine to produce nitric oxide (NO).

   2) Hydrogen (H_2) and nitrogen (N_2) combine to produce ammonia (NH_3) and heat.

   3) Potassium chlorate ($KClO_3$) uses heat to break down into potassium chloride (KCl) and oxygen (O_2).

4. Here are three chemical reactions. Write a balanced chemical equation, using the chemical formulas, for each reaction. Include "heat" on the side of the equation that it should appear. Last of all, tell whether each equation is exothermic or endothermic.

   1) Potassium chlorate ($KClO_3$) uses heat to break down into potassium chloride (KCl) and oxygen (O_2).

   2) Methane (CH_4) and oxygen (O_2) combine to produce carbon dioxide (CO_2) and water (H_2O) and heat.

   3) Water (H_2O) and carbon (C) and heat combine to produce carbon monoxide (CO) and hydrogen (H_2).

PHYSICAL SCIENCE

Laboratory

The student will identify at least 10 different solutions commonly found in the laboratory as being either acid, base, or neutral; and as being either dangerous or safe to ingest.

PS - 7

Pre-test: #1

Post-test: #2 or #4

PERFORMANCE INDICATORS:

1. Match the solution with the letter which best describes it.

_____ 1. HCl		
_____ 2. NaOH		
_____ 3. ammonia	A. acid; safe to swallow	
_____ 4. vinegar	B. acid; dangerous to swallow	
_____ 5. H_2O	C. base; safe to swallow	
_____ 6. H_2SO_4	D. base; dangerous to swallow	
_____ 7. HNO_3	E. neutral; safe to swallow	
_____ 8. chlorine bleach	F. neutral; dangerous to swallow	
_____ 9. $Ca(OH)_2$		
_____ 10. KOH		

2. List the following solutions under the headings that properly describe them. Then circle the ones that are dangerous to swallow.

ACID	BASE	NEUTRAL

HCl	H_2SO_4
NaOH	HNO_3
ammonia	chlorine bleach
vinegar	$Ca(OH)_2$
H_2O	KOH

3. Go through the chemical solutions in the laboratory. Tell the instructor which are acids, which are bases, and which are neutral; also, tell which are safe to swallow and which are dangerous to swallow.

4. Fill in the chart correctly with the names of the following substances. Use each substance in one block only.

   H_2SO_4, KOH, $Ca(OH)_2$, HNO_3, vinegar, ammonia, H_2O, HCl, NaOH, chlorine bleach

	Acid	Base	Neutral
Safe To Swallow			
Dangerous To Swallow			

PHYSICAL SCIENCE

States of Matter

The student will be able to identify correct examples of the Kinetic Theory of Matter.

PS - 8

Pre-test: #1

Post-test: #4

PERFORMANCE INDICATORS:

1. Here are some examples of the Kinetic Theory of Matter. Circle the numbers of the ones that are correct.

   1) A tire in the sun gets hotter than when it is in the shade. The pressure in the tire is greater when it is hot.

   2) If a tire is pumped up it, gets colder because the pressure increases.

   3) If the air in a balloon gets hotter, its volume decreases.

   4) If the air in a balloon gets colder, its volume decreases.

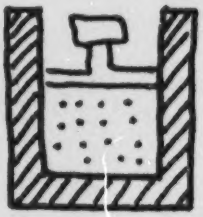
2. Write down two correct examples of how the Kinetic Theory of Matter works. Include relations between at least two of the following:

   temperature
   pressure
   volume

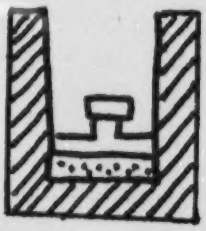
3. Tell your instructor two examples of how the Kinetic Theory of Matter works. Include relations between at least two of the following:

   temperature
   pressure
   volume

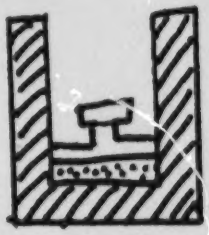
4. Here is a sealed box with an airtight plunger at top.



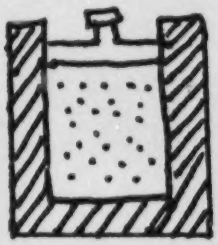
The plunger can be moved up and down to create different volumes of the box. No air can get in and no air can get out. Circle the numbers of the items which <u>correctly</u> describe what will happen to the air when it is compressed or decompressed. The sketch by each number shows the situation that is being described.

1) 

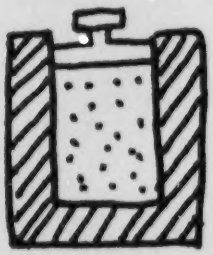
pressure has increased and temperature has decreased

2) 

pressure has decreased and temperature has increased

3) 

pressure has decreased and temperature has decreased

4) 

pressure has decreased and temperature has increased

PHYSICAL SCIENCE

Force and Energy

The student will be able to describe the force of gravity, including correct information about the following: what effect a change in the distance between two attracting bodies would have; what effect a change in the mass of both bodies would have; what causes an object on Earth to have weight; and the difference between mass and weight.

PS - 9

Pre-test: #1

Post-test: #2 or #3

PERFORMANCE INDICATORS:

1. Describe the force of gravity. Include in your description correct information about:

   1) what effect a change in the distance between two attracting bodies would have

   2) what effect a change in the mass of both bodies would have

   3) what causes an object on Earth to have weight

   4) the difference between mass and weight

   (answer orally or in writing)

2. Circle the correct answers.

   1) The closer attracting bodies are to each other, the _____ the force of gravity between them.

      A. greater B. less

   2) The farther attracting bodies are from each other, the _____ the force of gravity between them.

      A. greater B. less

   3) The smaller the total mass of attracting bodies, the _____ the force of gravity between them.

      A. greater B. less

4) The larger the total mass of attracting bodies, the _____ the force of gravity between them.

A. greater B. less

5) The difference between mass and weight is that

A. the weight of an object changes from place to place in the universe, but the mass of that object never changes.

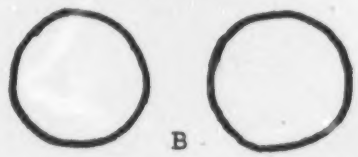
B. the mass of an object changes from place to place in the universe, but the weight of that object never changes.

3. What is the force of gravity? As two objects get nearer and nearer, what happens to the force of gravity between them? If the combined mass of two ojects (A and B) is greater than the combined mass of two other objects (C and D), and the distance from A to B is the same as the distance from C to D, in which pair will both objects attract each other more? Why does an object have weight on the Earth? What kind of object will weigh more - one with more mass or one with less mass? What is the difference between the mass of an object and the weight of that object? (oral or written)

4. The size of the following circles represents their mass. The larger the circle, the greater the mass. Some pairs are closer together than others. For each number, circle the letter of the pair which has the greater force of gravity between the two attracting bodies.

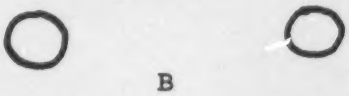
1)

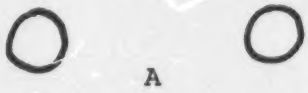
A

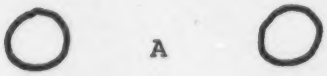


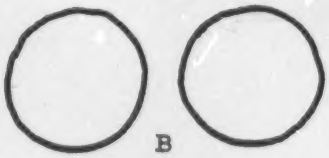
B

2)



3) 

4) 



5) Circle the letter of the correct answer.

You would weigh more if your body had _____ mass.

A. more
B. less

6) The difference between mass and weight is

A. the mass of an object changes from place to place in the universe; its weight never changes

B. they are always the same

C. the weight of an object is always more than its mass

D. the mass of an object never changes; its weight changes from place to place in the universe

PHYSICAL SCIENCE

Force and Energy

PS - 10

Pre-test: #2

Post-test: #1 or #3

The student will be able to define the force of friction and will be able to identify at least three specific examples of it.

PERFORMANCE INDICATORS:

1. Define orally or in writing the force of friction. Also, give three examples of how friction works.

2. Circle the letters of the correct answers.

   A. The force of friction is best described as

      1. the force created when two things rub together
      2. the force created by the pull of the earth
      3. the force created by electrons moving in a wire
      4. the force created when an atomic bomb goes off

   B. Circle the three examples of friction

      1. an object sliding on a table slows down
      2. the north and south poles of a magnet attract each other
      3. a space capsule slows down when it reaches the atmosphere
      4. you rub your hands together to keep them warm

3. Tell your instructor the definition of the force of friction. Then describe to your instructor three specific examples of how friction works.

4. Define the force of friction for your instructor. Then show your instructor three examples of that force in action.

PHYSICAL SCIENCE

Force and Energy

The student will be able to identify the following: why a magnetic needle of a compass will point North-South from most points on Earth; why there is a magnetic variation from true North-South on Earth; and which poles of magnets will attract and which will repel.

PS - 11

Pre-test: #1

Post-test: #3 and #4

PERFORMANCE INDICATORS:

1. Circle the letter of the correct answers.

   A. The poles of two magnets that will attract each other are: (circle two letters)

      1. North and South
      2. South and North
      3. North and North
      4. South and South

   B. The poles of two magnets that will repel each other are: (circle two letters)

      1. North and South
      2. South and North
      3. North and North
      4. South and South

   C. A magnetic compass needle usually points approximately North-South on Earth because:

      1. Earth's electrical field attracts the needle in that direction.
      2. Earth's magnetic field attracts the needle in that direction.
      3. the sun's attraction makes the needle point in that direction.
      4. the moon's attraction makes the needle point in that direction.

   D. The needle of a compass doesn't point true North-South because:

      1. the magnetic poles are located exactly at the North and South poles.
      2. sometimes the sun is on the other side of the Earth.

3. the magnetic poles are not located exactly at the North and South poles.
4. sometimes the moon is on the other side of the Earth.

2. If you had two magnets, which poles would attract? Which poles would repel? Why does the needle of a compass usually point approximately North-South on Earth? Why doesn't the needle point exactly North-South? (orally or in writing)

3. Fill in the blanks.

The magnetic needle of a compass usually points approximately North-South on the Earth because _____

_____.

But it hardly ever points true North-South because _____

_____.

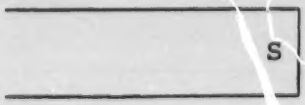
Two poles of two different magnets will repel if one is the _____ pole and the other is the _____ pole. Two poles that will attract each other are the _____ pole and the _____ pole.

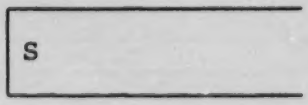
4. Circle the letter of the correct answer.

Here are some drawings of the ends of two magnets. Would they repel or attract each other?

1.

1. A) repel
   B) attract

2. 

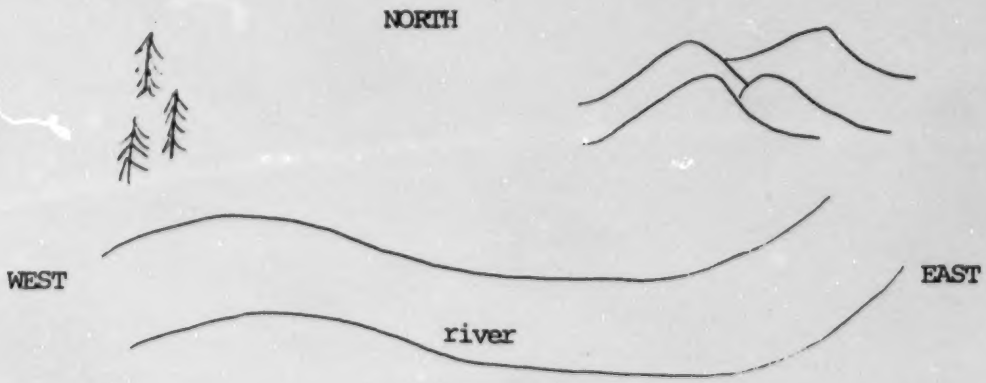


   A) repel
   B) attract

3.

   A) repel
   B) attract

4. Here is a simple map. If you had a magnetic compass needle, it would most likely point:
   (circle the correct letter)



   A. North-South

   B. East-West

   C. neither

5. You are looking down on the North Pole. In which sketch is the "X" located at the magnetic North pole? The dot where all the lines intersect is the geographic North Pole.

PHYSICAL SCIENCE

Force and Energy

The student will be able to calculate how much force must be applied to a specific lever, a specific pulley, and an object moving up a specific inclined plane to perform certain jobs.

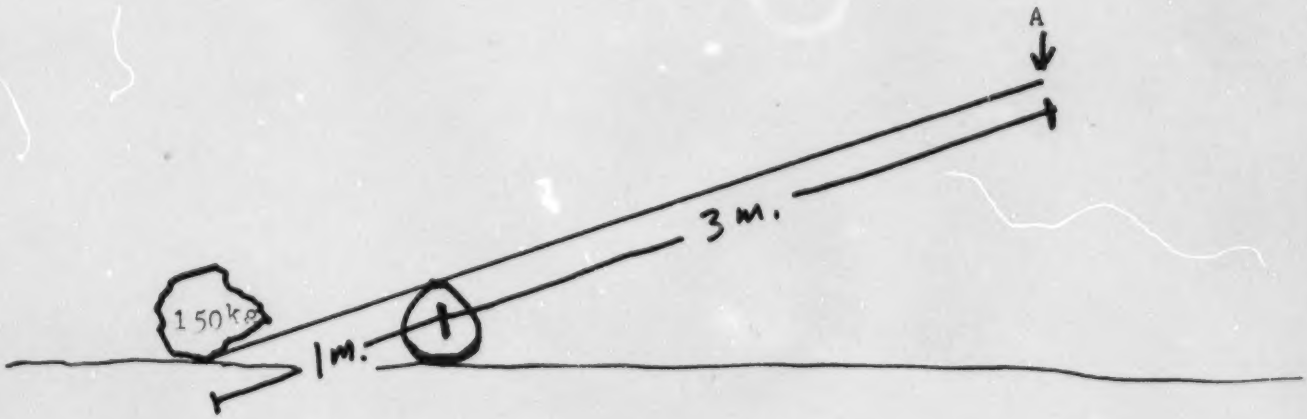
PS - 12

Pre-test: #1

Post-test: any

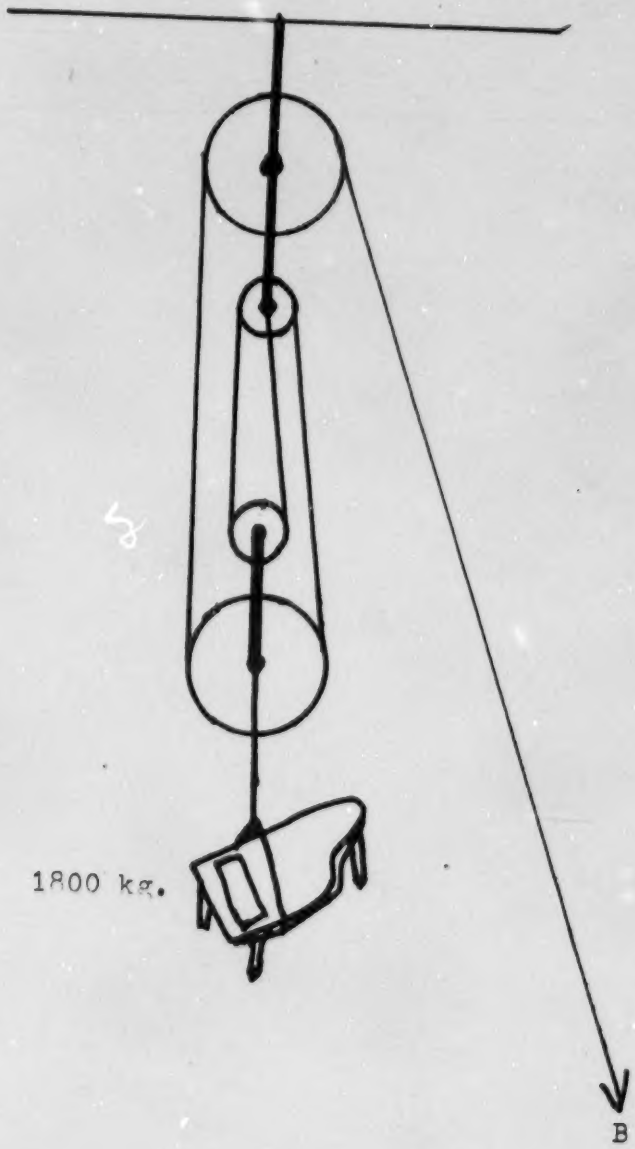
PERFORMANCE INDICATORS:

1. A. With how much force will someone have to push down on the board at point "A" before the 150 kilogram rock will begin to move? Assume that the board has no weight.

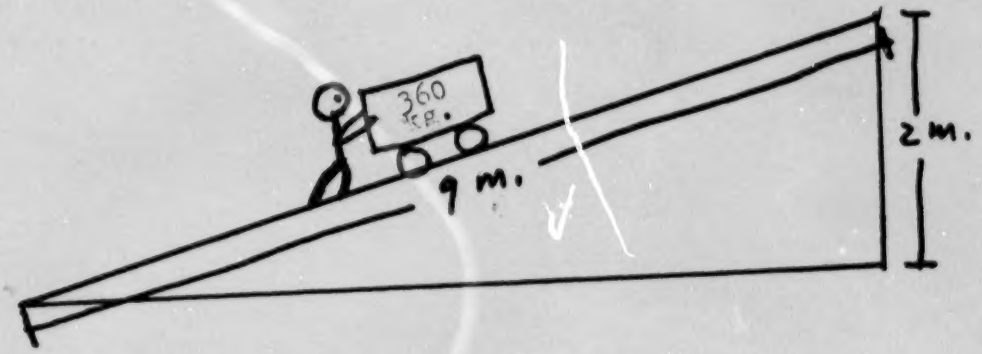


B. With how much force must someone pull the pulley wire at point"B" to raise the 1800 kilogram piano? Assume that no friction is present and that the pulleys and steel wire have no weight.

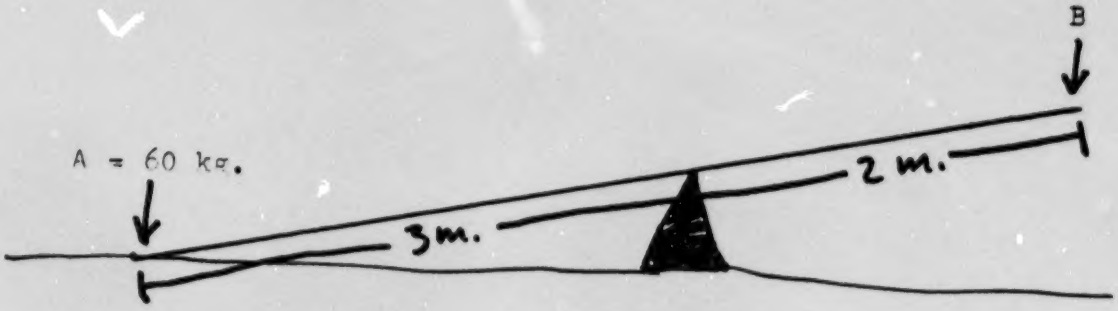
1. B. diagram



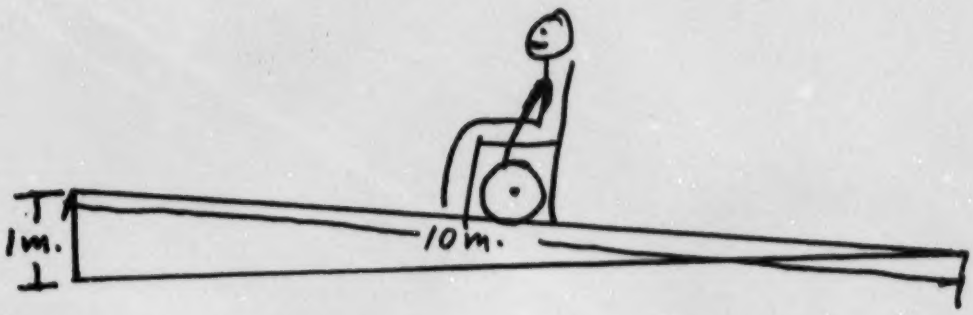
C. With how much force must the person push to keep the 360 kilogram ore cart from moving back down the ramp? Assume that no friction is present.



2. A. How much would a person sitting on the "B" side of the seesaw have to weigh to balance a 60 kilogram person sitting on the other side? Assume that no friction is present and that the seesaw does not have any weight.

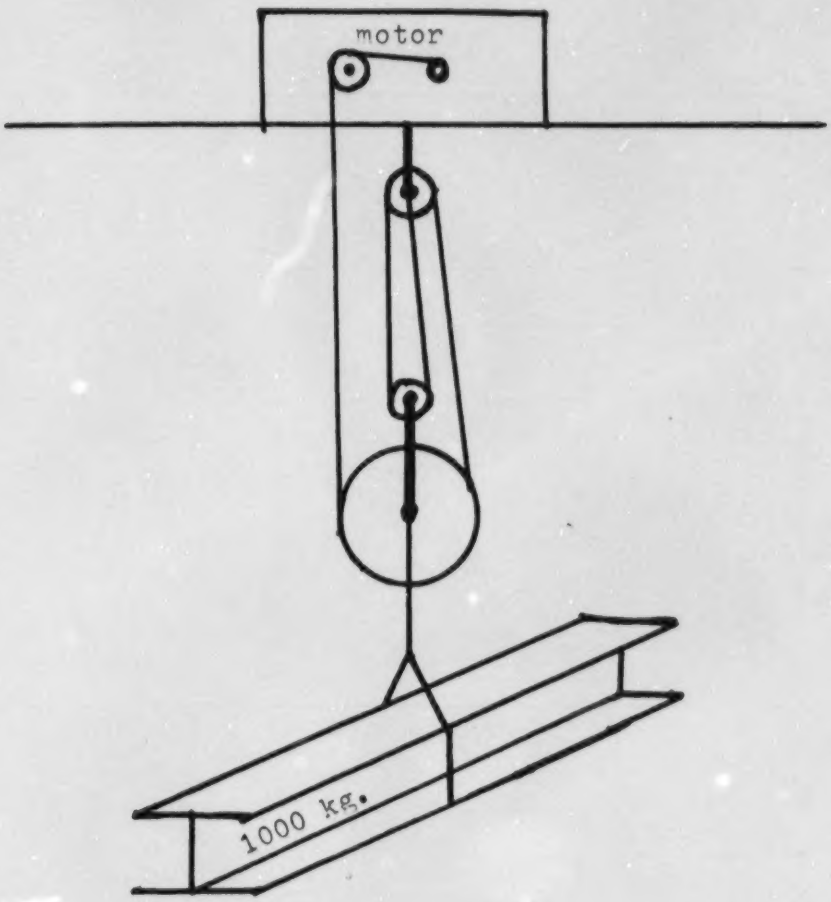


B. How much force will a person in a wheel chair have to use to push herself or himself up the ramp if the person and the wheel chair together weigh 100 kilograms? Assume that there is no friction present.



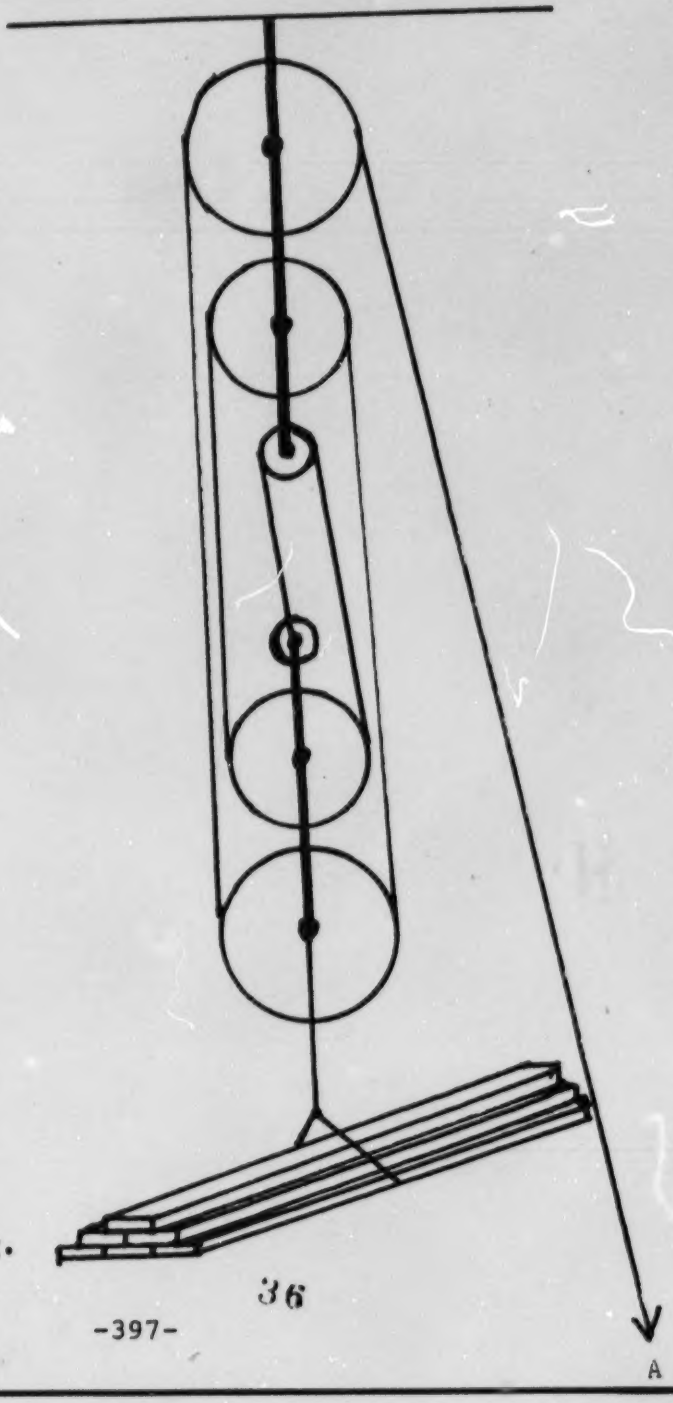
C. How much force will a motor have to use to raise the 1000 kilogram steel girder using the pulley system shown? Assume that there is no friction present and that the pulleys and steel wires have no weight.

2. C. Diagram

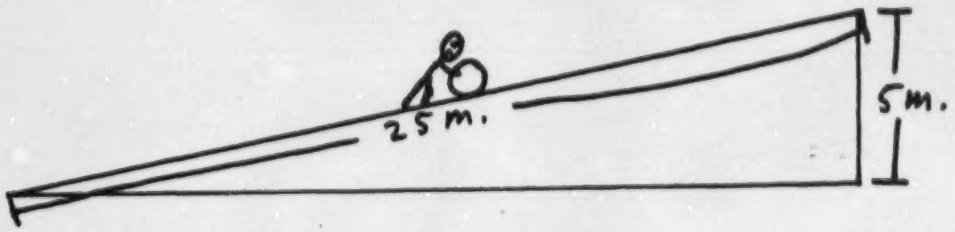


3. A. With how much force must someone pull the rope at point "A" before the 250 kilogram load of lumber can be raised? Assume that there is no friction present and that the pulleys and rope have no weight.

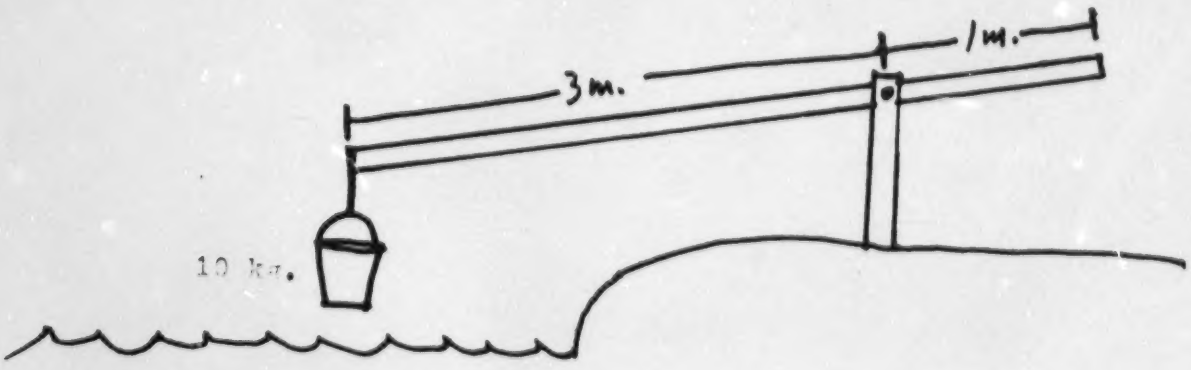
3. A. Diagram



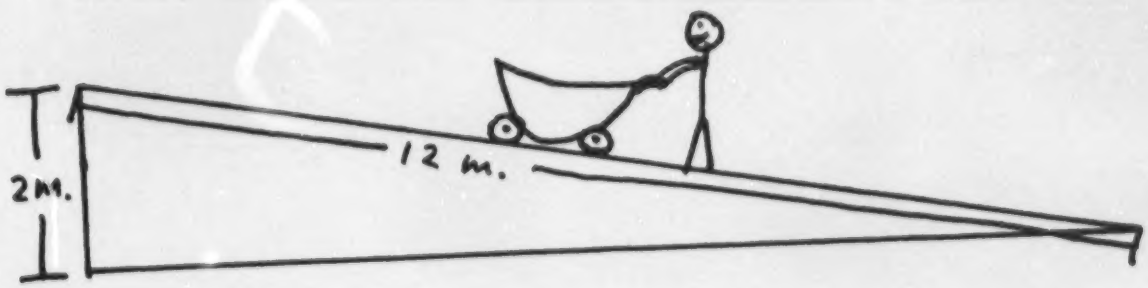
B. How much force must the lumberjack use to roll a 200 kilogram log up the ramp?



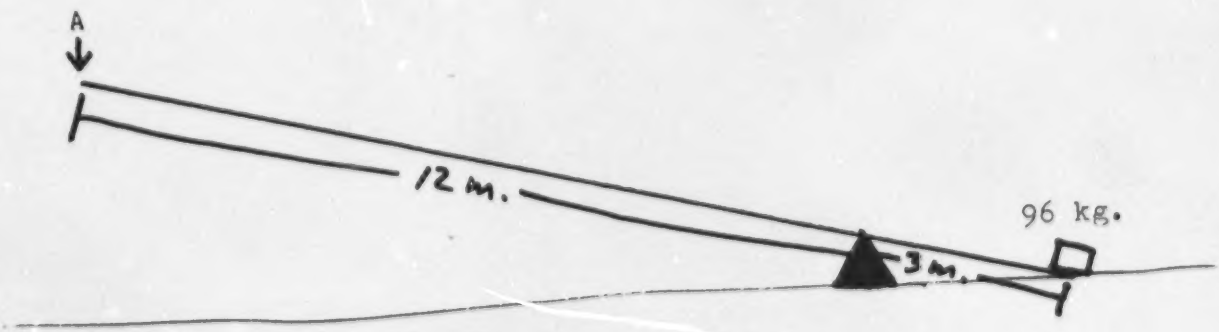
C. How much force will a person have to apply at point "A" to lift a 10 kilogram bucket of water? Assume that there is no friction present and that the board and rope have no weight.



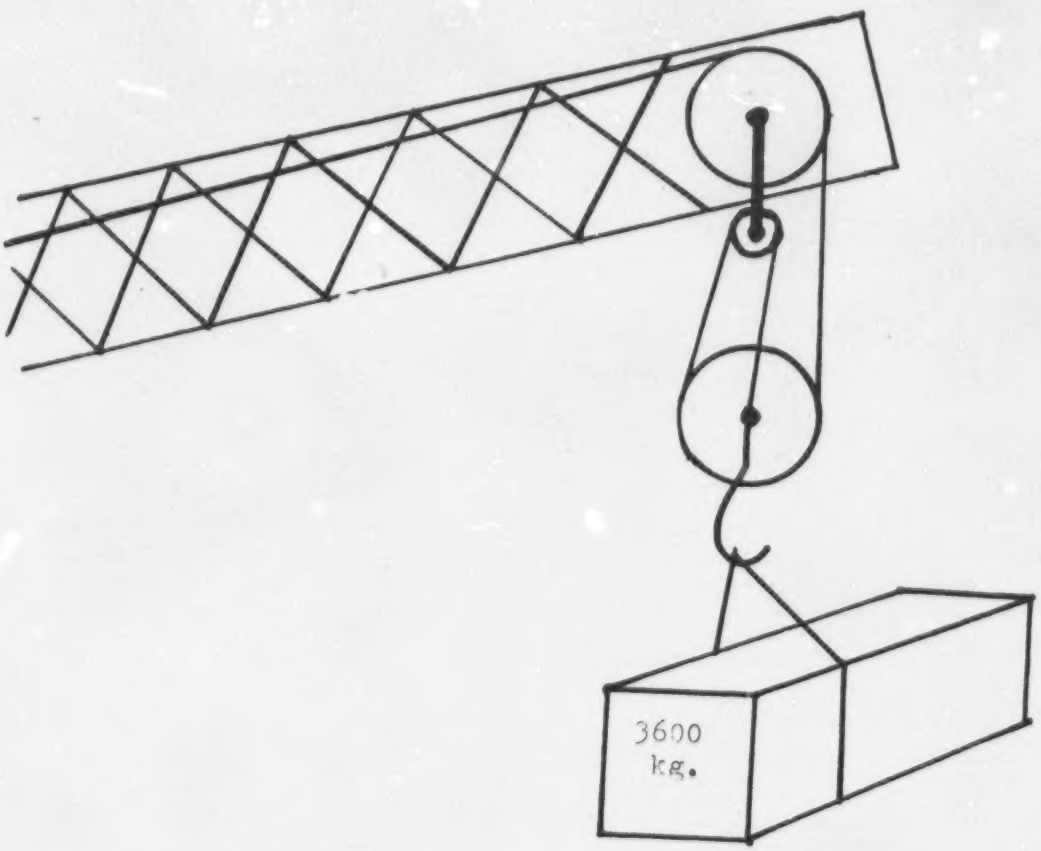
4. A. How much force must the mother use to push her baby in a carriage up the ramp? The baby and carriage together weigh 24 kilograms. Assume that no friction is present.



B. How much force must be used at point "A" to lift a 96 kilogram load? Assume that there is no friction present and that the lever has no weight.



C. How much force must a ship's crane motor use to lift a 3600 kilogram load of cargo from the hold using the pulley system shown? Assume that there is no friction present and that the pulleys and steel wires have no weight.



PHYSICAL SCIENCE

Force and Energy

PS - 13

Pre-test: #1

Post-test: #3 and #4

The student will be able to identify examples of the following heating terms (conduction, convection, insulation, radiation).

PERFORMANCE INDICATORS:

1. Match the heating terms with examples of them.

_____ 1. conduction	A. Styrofoam slows down heat from being lost through the walls of a house.
_____ 2. convection	B. The handle of a spoon that has been in soup gets too hot to hold,
_____ 3. insulation	C. Hot air from the heater rises toward the ceiling.
_____ 4. radiation	D. A fireplace gives off infrared rays and makes you feel warm.

2. Give an example orally or in writing of each of the following heating terms.

insulation, conduction, radiation, convection

3. Here are examples of specific heating terms. Put the name of the term that each example describes on the line in front of the example.

_____ 1. The exchange of hot air and cooler air just above the surface of a road.

_____ 2. A hot water faucet handle is too hot to hold.

_____ _____ 3. The sun makes you warm.

_____ 4. Fiberglass slows the flow of heat through your ceiling.

4. Fill in the blanks with the following heating terms. Each answer is used only once.

insulation radiation

conduction convection

If you cannot touch an iron poker that has been laying in a fire, it is because heat _____ has taken place from the fire, through the poker, to the handle. You can pick up the poker with a newspaper wrapped around the handle because the newspaper acts as _____. The fire in the fireplace makes your face hot because _____ is striking your face in the form of infrared rays. Hot air rises through the chimney because of heat _____.

PHYSICAL SCIENCE

Electrical

PS - 14

Pre-test: #1

Post-test: #3 or #4

The student will be able to explain how electromagnetic induction can produce an electrical current in a wire.

PERFORMANCE INDICATORS:

1. Explain in writing how an electromagnetic induction can produce an electrical current in a wire.

2. In the following, circle the number of the example which correctly describes how electromagnetic induction can produce an electrical current in a wire.

   A. 1) A magnet pulls electrons from the end of the wire.
      2) The wire is near a piece of uranium.
      3) One wire from a battery carries a negative charge; the other wire carries a positive charge.
      4) The wire is moved in a magnetic field.

   B. 1) A wire pulls electrons from one side of a magnet.
      2) A magnetic field is moved around a wire.
      3) A piece of uranium is moved around a wire.
      4) A flashlight battery has a positive and a negative end.

3. Fill in the blank.

   Electromagnetic induction can be produced by _____.

4. Tell your instructor how electromagnetic induction can produce an electrical current in a wire.

PHYSICAL SCIENCE

Electricity

The student will be able to define the following terms: static electricity, electric current, conductor, and insulator.

PS - 15

Pre-test: #1 and #3
Post-test: #2 or #4

PERFORMANCE INDICATORS:

1. Match the letter of the definition with the correct electrical term.

_____ 1. static electricity	A. a substance which allows electrons to flow through it very easily
_____ 2. electric current	B. a constant flow of electrons
_____ 3. conductor	C. usually, a rapid, momentary flow of electrons from one place to another
_____ 4. insulator	D. a substance which virtually stops the flow of electrons

2. Define in writing the following electrical terms.

conductor static electricity

insulator electric current

3. Fill in the blanks correctly with the following terms.

conductor static electricity

insulator electric current

A(n) _____ flows through a wire constantly. If rubber is on the outside of that wire, it acts as a(n) _____. Copper is

a good thing to make a wire from because it is a good _____.

When electrons rapidly flow from one place to another for a very brief period of time, it is usually a demonstration of _____.

4. Tell your instructor a correct definition for each of the following electrical terms.

conductor	static electricity
insulator	electric current

PHYSICAL SCIENCE

Electricity

The student will be able to identify the difference between alternating and direct current, and will identify at least one use for each.

PS - 16

Pre-test: #2

Post-test: #3 and #4

PERFORMANCE INDICATORS:

1. Explain the difference between an alternating current (AC) and a direct current (DC). In your explanation include how the flow of electrons differs in each. Then give one example each of how those currents can be used.

2. Circle the correct letter.

   1. The best explanation of the dirrerence between direct current (DC) and alternating current (AC) is:

      A) The current in a wire that carries DC first moves in one direction and then moves in the opposite direction; if the same wire carries AC the electrons move in only one direction.

      B) The current in a wire that carries AC first moves in one direction and then moves in the opposite direction; if the same wire carries DC, the electrons move in only one direction.

      C) Both AC and DC are similar; DC is a stronger current.

      D) Both AC and DC are similar; AC is a stronger current.

   2. Put "AC" in front of the examples of AC and "DC" in front of the examples of DC.

      _____ a. house current that runs your TV

      _____ b. dry cell flashlight battery

_____ c. car battery

_____ d. electricity from a generator

3. Fill in the blanks with either "AC" for alternating current or "DC" for direct current.

The current in a wire is called _____ if it moves in only one direction. If it moves in one direction first and then moves in the opposite direction it is called _____. One example of how _____ is used is the current in your house for your refrigerator, stereo, etc. One example of _____ is the current that comes from dry cell flashlight batteries.

4. Match the letter of the correct current with the description of that current.

A = alternating current (AC) B = direct current (DC)

_____ 1) a current which moves in only one direction through a wire

_____ 2) a current which moves first in one direction and then in the opposite direction

_____ 3) the kind of current that a car battery puts out

_____ 4) the kind of current a socket in your home puts out

PHYSICAL SCIENCE

Electricity

The student will be able to define the following electrical terms: volt, ampere, watt, and ohm.

PS - 17

Pre-test: #1

Post-test: #3 or #4

PERFORMANCE INDICATORS:

1. Match the definition with correct electrical term.

_____ 1. volt	A.	a measure of resistance to the flow of electrons in a wire
_____ 2. ampere	B.	a measure of the speed that electrical energy is changed into other forms of energy
_____ 3. watt	C.	a measure of the number of electrons moving past a point in a wire
_____ 4. ohm	D.	a measure of the amount of work that could be done if electrons moved between two points in a wire

2. Fill in the blanks with the following electrical terms:

watts amperes

ohms volts

_____ measure the amount of work that could be done if electrons moved between two points in a wire. _____ measure resistance. _____ measure the speed that electrical energy is changed into other forms of energy. _____ measure the number of electrons moving past a point in a wire.

3. Write the answer to the following questions:

   What electrical unit of measurement measures resistance?

   What unit measures how much electrical energy is used?

   What unit measures how many electrons flow through a wire?

   What unit measures the potential energy of a battery?

4. Orally define the following electrical terms:

   ampere

   watt

   volt

   ohm

PHYSICAL SCIENCE

Radioactivity

The student will be able to explain how a nuclear fission reactor can be controlled to produce electricity. The explanation must include how the reactor is kept cool, how the reaction is controlled, and how the heat energy from the reactor can be changed into electrical energy.

PS - 18

Pre-test: #1

Post-test: #3 or #4

PERFORMANCE INDICATORS:

1. Explain in writing how a nuclear fission reactor can be controlled to produce electricity. How is it kept cool? How is the reaction controlled? How is the heat energy from the reactor changed into electrical energy?

2. Circle the letters of the correct answers.

   The best explanation of how a nuclear fission reactor can be controlled to produce electricity is:

   1) Control rods are _____ the atomic pile to slow the reaction.

      A. pulled out of
      B. pushed into

   2) Control rods are _____ the atomic pile to make the reaction go faster.

      A. pulled out of
      B. pushed into

   3) The reactor is kept cool by

      A. refrigeration
      B. a constant flow of cool water aroung the pile
      C. condensation

   4) A. The heat from the reactor is used to change water to steam; the steam produces electricity; the electricity drives a turbine.
      B. The steam from the reactor is used to p[illegible] water through a turbine;

the water is changed to electricity; the electricity is used to run a generator.

C. The heat from a reactor is used to change water to steam; the steam drives a turbine; the turbine is connected to a generator, which produces electricity.

D. The electricity from a reactor is used to drive a turbine; the turbin draws water up a hill; the water falls through a generator, which produces electricity.

3. Tell your instructor how a nuclear fission reactor can be controlled to produce electricity. Tell how the reaction is controlled. Tell how the atomic pile is kept cool. Tell how the heat energy from the reactor can be changed into electrical energy.

4. Fill in the blanks.

A nuclear reactor can be controlled by _____

_____.

The reaction can be slowed by _____

_____.

It can be speeded up by _____

_____.

The atomic pile is usually kept cool by _____

_____.

The heat energy the reaction produces can be changed into electrical

_____

_____.

PHYSICAL SCIENCE

Metals

The student will be able to identify examples of metals found in the home as being either steel, aluminum, copper, tungsten, or lead; and will be able to indicate at least one common use in the home for each; and will be able to tell which are magnetic.

PS - 19

Pre-test: #2

Post-test: #4

PERFORMANCE INDICATORS:

1. Circle the numbers of the metals that are magnetic. After the name of every metal, give one way that the metal is commonly used in the home.

   1) steel

   2) aluminum

   3) copper

   4) tungsten

   5) lead

   6) brass

2. Match each metal with an example of how it is commonly used in the home. Then put an "M" after the ones that are magnetic. Each answer is used only once.

_____ 1. copper ____	A. light bulb filament
_____ 2. lead ____	B. solder ingredient
_____ 3. steel ____	C. foil wrapper
_____ 4. brass ____	D. water pipes that are safe
_____ 5. tungsten ____	E. stainless eating utensils
_____ 6. aluminum ____	F. window lock

3. Here are some examples of how certain metals are commonly used in the home. Write what each metal is in the blank, and identify the ones that are magnetic by circling those numbers.

_____ 1. an ingredient in some paints that makes it very dangerous to use on things that small children might chew

_____ 2. a TV dinner tray

_____ 3. a light bulb filament

_____ 4. wiring

_____ 5. scissors

_____ 6. a gold-colored door hinge

4. Given the following, tell orally or in writing what each metal is and whether it is magnetic or not.

1. a soda pop can
2. a piece of wire
3. a spoon
4. a door hinge
5. a piece of solder
6. a light bulb filament

(NOTE: the pop can must be aluminum, the wire must be copper, the spoon must be steel (stainless), the hinge must be brass, the solder must have lead in it, the filament must be tungsten)

PHYSICAL SCIENCE

Household Chemicals

The student will be able to identify which of the following household chemicals would be dangerous to ingest in any quantity: gasoline, rubbing alcohol, salt, sugar, baking soda, perfume, chlorine bleach, detergent, insecticides, water, paint thinner (mineral spirits).

PS - 20

Pre-test: #1

Post-test: #2

PERFORMANCE INDICATORS:

1. Circle the numbers of the items below that would be dangerous to swallow in any quantity.

    1. gasoline
    2. rubbing alcohol
    3. salt
    4. sugar
    5. baking soda
    6. perfume
    7. chlorine bleach
    8. detergent
    9. insecticide
    10. pure water
    11. paint thinner (mineral spirits)

2. Which of the following would be dangerous to swallow in any quantity? (orally or in writing)

    baking soda, pure water, sugar, insecticide, paint thinner (mineral spirits), gasoline, salt, chlorine bleach, rubbing alcohol, perfume, detergent

3. Put an "X" in front of those items that would be dangerous to swallow in any quantity.

    _____ 1. rubbing alcohol

    _____ 2. sugar

_____ 3. perfume

_____ 4. detergent

_____ 5. pure water

_____ 6. gasoline

_____ 7. salt

_____ 8. baking soda

_____ 9. chlorine bleach

_____10. insecticide

_____11. paint thinner

4. Matching. Are the following dangerous to swallow or not dangerous to swallow in any reasonable amount?

A = dangerous B = not dangerous

_____ 1. salt

_____ 2. perfume

_____ 3. insecticide

_____ 4. rubbing alcohol

_____ 5. baking soda

_____ 6. detergent

_____ 7. paint thinner

_____ 8. gasoline

_____ 9. sugar

_____10. chlorine bleach

_____11. water

ANSWERS

ES - 1

1. Water erosion:

    1. rain water washes soil away - use contour plowing
    2. a river wears away its banks - the banks can be reinforced with sandbags
    3. a beach is shifted down the coast because of tide erosion - install jetties
    4. there are many other answers that would be acceptable

    Ice erosion:

    1. water gets into the cracks in rocks; it freezes; the rock breaks due to the expansion of the ice
    2. a glacier wears away the rock and soil under it
    3. some other acceptable answers

    Wind erosion:

    1. the wind picks up sand and throws it against rock, which wears away - install windbreaks
    2. sand dunes shift their position due to the wind - install windbreaks and/or picket fencing
    3. the wind picks up dry soil and blows it away - install windbreaks
    4. there are other acceptable answers

2. Same as #1.

3. Same as #1, but answers will be sketches; the student should be encouraged to either explain drawings or label them.

4. Same as #1.

ANSWERS

ES - 2

1. nitrogen

   78%

   oxygen

   21%

2. 3 and 4 should be circled.
   3. A
   4. E

3. B

   A and B

4. nitrogen (78%) and oxygen (21%)

ES - 3

1. A. 3
   B. 1

2. 86%, 29.99 inches, fall

3. 1. G
   2. F
   3. E

   These two answers can be interchanged.

4. A. 2
   B. 2

ES - 4

1. 1) Sun or Sol
   2) Mercury
   3) Venus
   4) Moon or Luna
   5) Earth
   6) Mars
   7) asteroid belt
   8) Jupiter

ANSWERS

9) Saturn
10) Uranus
11) Neptune
12) Pluto

2. Diagram can resemble #1; check student's diagram - it must be within the guidelines set down in the instructions.

3. Answer must follow guidelines set down in the instructions.

4. Same as #3.

ES - 5

1. 1. C
2. G
3. G
4. D
5. E
6. A
7. F
8. B

2. 1) B
2) A
3) B
4) C
5) B
6) C
7) A
8) B

3. 1. head for the high ground away from the rising water
2. get as far away from the area of eruption as possible; beware of hot ash and lava falling from the sky
3. stay away from trees, flagpoles, etc.; if out in the open, lie down
4. get behind the path of the fire's front; if caught in it, stay low and get your clothing wet and pull it over your head
5. stay out of and away from buildings

ANSWERS

6. move inland as far as possible
7. it is good to keep a few windows open so that the very low pressure will not cause your house to explode; stay indoors
8. board up all the windows in the house and move all loose things inside

4. earthquake, tidal wave, flood, lightning storm, hurricane, tornado, volcanic eruption, forest fire

ANSWERS

PS - 6

1. ($\longleftrightarrow$ can replace $\longrightarrow$ in any of the following answers.)

   1) $C + O_2 \longrightarrow CO_2 + \text{heat}$ (exothermic)

   2) $2H_2 + O_2 \longrightarrow 2H_2O + \text{heat}$ (exothermic)

   3) $H_2O + C + \text{heat} \longrightarrow CO + H_2$ (endothermic)

2. 1) $CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O + \text{heat}$ (exothermic)

   2) $H_2O + C + \text{heat} \longrightarrow CO + H_2$ (endothermic)

   3) $2CO + O_2 \longrightarrow 2CO_2 + \text{heat}$ (exothermic)

3. 1) $N_2 + O_2 + \text{heat} \longrightarrow 2NO$ (endothermic)

   2) $3H_2 + N_2 \longrightarrow 2NH_3 + \text{heat}$ (exothermic)

   3) $2\ KClO_3 + \text{heat} \longrightarrow 2KCl + 3O_2$ (endothermic)

4. 1) same as #3 - 3)

   2) same as #2 - 1)

   3) same as #2 - 2)

PS - 7

1. 1. B
   2. D
   3. D
   4. A
   5. E
   6. B
   7. B
   8. D
   9. D
   10. D

2. Acid - HCl, vinegar, H_2SO_4, HNO_3

   All should be circled except vinegar.

ANSWERS

Base - NaOH, ammonia, chlorine bleach, $Ca(OH)_2$, KOH

All should be circled.

Neutral - H_2O

3. Answers will vary according to the solutions used.

4. See answers to #1 and #2.

PS - 8

1. 1) and 4)

2. 1) Higher temperature means higher pressure, and vice versa, in a closed area of fixed volume.

   2) More volume means less pressure in a balloon.

   3) Higher temperature means more volume in a balloon.

   4) There are many other correct examples.

3. Same as #2.

4. 3)

PS - 9

1. Gravity is the force of attraction between two objects. The closer they are, the greater the attraction. The more mass they have, the greater the attraction. An object on Earth has weight because the object and the Earth have mass and attract each other. The more mass the object has, the more it weighs. The mass of an object never changes. Its weight changes from place to place in the universe.

2. 1) A
   2) B
   3) B
   4) A
   5) A

ANSWERS

3. The force of gravity is the attraction two objects have for each other.

   As they get nearer, the force increases.

   A and B

   The Earth and the object attract each other.

   more mass

   Mass is always the same, weight changes from place to place in the universe.

4. 1) B
   2) A
   3) B
   4) B
   5) A
   6) D

PS - 10

1. Friction is when two objects rub against each other.

   1. A block of wood slows down after being slid across the floor.
   2. You rub your hands together to keep them warm.
   3. A drill bit gets hot when used.
   4. Many other answers are acceptable.

2. A. 1
   B. 1, 3, and 4

3. Same as #1.

4. Same as #1, but the student must <u>show</u> the examples in a real life situation.

PS - 11

1. A. 1, 2
   B. 3, 4
   C. 2
   D. 3

ANSWERS

2. Opposite poles attract.

   Like poles repel.

   Earth has a magnetic field.

   The magnetic poles are not located exactly at the geographic North and South Poles.

3. the Earth has a magnetic field

   the magnetic poles are not located exactly at the geographic North and South Poles

   North South
   or
   North South

   North South
   or
   South North

4. 1. B
   2. A
   3. A
   4. A
   5. A

PS - 12

1. A. 50 kg.
   B. 450 kg.
   C. 80 kg.

2. A. 90 kg.
   B. 10 kg.
   C. 250 kg.

3. A. 50 kg.
   B. 40 kg.
   C. 30 kg.

ANSWERS

4. A. 4 kg.
   B. 24 kg.
   C. 1200 kg.

PS - 13

1. 1. B
   2. C
   3. A
   4. D

2. insulation - A potholder can be used to pick up a hot pan.

   conduction - The handle of a pan gets hot when left on the stove.

   radiation - A campfire keeps you warm at night.

   convection - Heat from a vent in your floor rises towards the ceiling.

3. 1. convection
   2. conduction
   3. radiation
   4. insulation

4. conduction, insulation, radiation, convection

PS - 14

1. If the wire is moved in a magnetic field, electrons will move in the wire; or a magnetic field is moved around a wire. (Either answer is acceptable.)

2. A. 4
   B. 2

3. A wire moving in a magnetic field; or a magnetic field moving around a wire. (Either answer is acceptable.)

4. Same as #1.

ANSWERS

PS - 15

1. 1. C
   2. B
   3. A
   4. D

2. conductor - a substance which allows electrons to flow through it easily

   insulator - a substance which stops the flow of electrons

   static electricity - a rapid, momentary flow of electrons from one place to another

   electric current - a constant flow of electrons

3. electric current, insulator, conductor, static electricity

4. Same as #2.

PS - 16

1. DC moves in one direction only. AC moves first in one direction and then in the opposite direction.

2. 1. B

   2. a. AC
      b. DC
      c. DC
      d. AD

3. DC, AC, AC, DC

4. 1) B
   2) A
   3) B
   4) A

PS - 17

1. 1. B
   2. C
   3. D
   4. A

ANSWERS

2. volts, ohms, watts, amperes

3. ohm

   watt

   ampere

   volt

4. ampere - a measure of the number of electrons moving past a point in a circuit

   volt - a measure of the amount of work that could be done if electrons moved between two points in a circuit

   watt - a measure of the speed that electrical energy is changed into other forms of energy

   ohm - a measure of resistance to the flow of electrons in a wire

PS - 18

1. Control rods are pushed into the atomic pile to slow the reaction. They are pulled out to make the reaction go faster. The reaction is kept cool by a constant flow of cool water around the pile. The heat from the reactor is used to change water to steam; the steam drives a turbine; the turbine is connected to a generator, which produces electricity.

2. 1. B
   2. A
   3. B
   4. C

3. Same as #1.

4. control rods

   pushing the control rods in

ANSWERS

4. pulling the control rods out

   a flow of cool water around the pile

   heating water to make steam and using the steam to drive a turbine, which is connected to a generator

PS - 19

1. 1) is magnetic

   1) utensils - knives, forks, spoons
   2) storm window framing
   3) coating on the bottom of pans
   4) light bulbs
   5) solder
   6) hinges

   There are many other acceptable answers.

2. 1. D
   2. B
   3. E M
   4. F
   5. A
   6. C

3. 1. lead
   2. aluminum
   3. tungsten
   4. copper
   5. steel
   6. brass (steel might be acceptable)

4. 1. aluminum - not magnetic
   2. copper - not magentic
   3. steel - magnetic
   4. brass - not magnetic
   5. lead - not magnetic
   6. tungsten - not magnetic

ANSWERS

PS - 20

1. The following should be circled: 1, 2, 6, 7, 8, 9, 11

2. insecticide, paint thinner, gasoline, chlorine bleach, rubbing alcohol, perfume, detergent

3. The following should have an "X" before them:

   1, 3, 4, 6, 9, 10, 11

4. 1. B
   2. A
   3. A
   4. A
   5. B
   6. A
   7. A
   8. A
   9. B
   10. A
   11. B